

IN THE CLAIMS:

1. A medical device comprising a multilayer region that comprises:
  - (a) a charged nanoparticle layer comprising charged nanoparticles; and
  - (b) a plurality of charged polyelectrolyte layers comprising charged polyelectrolyte species,wherein said medical device is configured for implantation or insertion into a subject.
2. The medical device of claim 1, wherein said medical device is selected from a balloon catheter, a graft, a stent and a filter.
3. The medical device of claim 1, wherein said multilayer region comprises a plurality of charged nanoparticle layers.
4. The medical device of claim 1, said multilayer region comprises a plurality of charged nanoparticle layers that comprise nanoparticles selected from carbon nanoparticles, silicate nanoparticles, and ceramic nanoparticles.
5. The medical device of claim 1, wherein said multilayer region comprises a plurality of charged nanoparticle layers that comprise nanoparticles selected from carbon nanotubes, carbon nanofibers, fullerenes, ceramic nanotubes, ceramic nanofibers, phyllosilicates, monomeric silicates and dendrimers.
6. The medical device of claim 1, wherein said multilayer region comprises a plurality of charged nanoparticle layers that comprise single walled carbon nanotubes.
7. The medical device of claim 1, wherein said multilayer region comprises a plurality of charged nanoparticle layers that comprise nanoparticles ranging from 0.5 to 100 nm in smallest dimension.

8. The medical device of claim 1, wherein said multilayer region comprises a plurality of charged polyelectrolyte layers that comprise a polycation selected from polyallylamine, polyethyleneimine, poly(dimethyl diallyl ammonium chloride), protamine sulfate, chitosan, gelatin, spermidine, and albumin, and a plurality of charged polyelectrolyte layers that comprise a polyanion selected from poly(styrene sulfonic acid), poly(aniline sulfonic acid), polyacrylic acid, sodium alginate, polystyrene sulfonate, eudragit, gelatin, hyaluronic acid, carrageenan, chondroitin sulfate, carboxymethylcellulose.
9. The medical device of claim 1, wherein said multilayer region comprises from 10 to 200 charged polyelectrolyte and nanoparticle layers.
10. The medical device of claim 1, wherein said multilayer region comprises a therapeutic agent.
11. The medical device of claim 1, wherein a protective polymer coating layer is provided over at least a portion of said multilayer region.
12. The medical device of claim 1, wherein said plurality of charged polyelectrolyte layers comprises a biodegradable charged polyelectrolyte layer.
13. The medical device of claim 12, wherein a therapeutic agent is provided beneath or within said biodegradable polyelectrolyte layer.
14. The medical device of claim 1, wherein said medical device comprises a plurality of said multilayer regions.
15. The medical device of claim 1, wherein at least a portion of said multilayer region is freestanding.
16. The medical device of claim 1, wherein at least a portion of said multilayer region is disposed on an underlying or overlying structure.

17. The medical device of claim 16, wherein said underlying or overlying structure is a temporary structure that is not implanted or inserted with said medical device.
18. The medical device of claim 16, wherein said underlying or overlying structure is a permanent structure that forms part of said medical device.
19. The medical device of claim 16, wherein said underlying structure is a balloon.
20. The medical device of claim 16, wherein said underlying structure is a catheter.
21. The medical device of claim 16, wherein said underlying structure is a stent.
22. The medical device of claim 16, wherein said underlying structure is a graft.
23. The medical device of claim 16, wherein a patterned multilayer region is provided over said underlying structure.
24. The medical device of claim 16, wherein said underlying structure is a ceramic, metallic or polymeric structure.
25. The medical device of claim 1, wherein one or more reinforcement members are provided adjacent to or within said multilayer region.
26. The medical device of claim 1, wherein said one or more reinforcement members are in the form of a fiber mesh, a fiber braid or a fiber winding.
27. The medical device of claim 1, further comprising a residue from a removable substrate adjacent said multilayer region.

28. The medical device of claim 1, wherein charged nanocapsules, which comprise a plurality of charged polyelectrolyte encapsulation layers, are incorporated into said multilayer region.

29. The medical device of claim 28, wherein said charged nanocapsules comprise a therapeutic agent.

30. The medical device of claim 10, wherein said therapeutic agent is selected from anti-thrombotic agents, anti-proliferative agents, anti-inflammatory agents, anti-migratory agents, agents affecting extracellular matrix production and organization, antineoplastic agents, anti-mitotic agents, anesthetic agents, anti-coagulants, vascular cell growth promoters, vascular cell growth inhibitors, cholesterol-lowering agents, vasodilating agents, and agents that interfere with endogenous vasoactive mechanisms.

31. A method of providing the medical device of claim 1, comprising  
providing a substrate;  
applying a series of charged layers over said substrate, wherein each successive layer is opposite in charge to a previously applied layer and wherein said series of charged layers comprises: (a) a charged nanoparticle layer that comprises charged nanoparticles and (b) a plurality of said charged polyelectrolyte layers that comprise charged polyelectrolyte species.

32. The method of claim 31, wherein said series of charged layers comprises a plurality of nanoparticle layers that comprises charged nanoparticles.

33. The method of claim 32, comprising applying an alternating series of negatively charged nanoparticle layers and positively charged polyelectrolyte layers.

34. The method of claim 32, comprising applying an alternating series of positively charged nanoparticle layers and negatively charged polyelectrolyte layers.

35. The method of claim 31, comprising a series of charged layers to reinforce the substrate.
36. The method of claim 32, wherein said charged nanoparticle and polyelectrolyte layers are applied over said substrate by spraying.
37. The method of claim 32, wherein said charged nanoparticle and polyelectrolyte layers are applied over said substrate by dipping.
38. The method of claim 32, wherein said substrate becomes part of the finished medical device.
39. The method of claim 32, wherein said substrate is removed.
40. The method of claim 39, wherein a balloon is formed over said substrate.
41. The method of claim 39, wherein said substrate is used to cover a surface of a stent.
42. The method of claim 39, wherein said multilayer region is deposited over an inside surface of said substrate.
43. The method of claim 42, wherein said substrate covers an outer surface of a stent and said multilayer region is deposited over an inside surface of said stent and said substrate.
44. The method of claim 42, wherein a balloon is formed over an inside surface of said substrate.
45. The method of claim 39, wherein said multilayer region is deposited over an outside surface of said substrate.

46. The method of claim 45, wherein said substrate covers an inner surface of a stent and said multilayer region is deposited over an outside surface of said stent and said substrate.
47. The method of claim 45, wherein a balloon is formed over an outside surface of said substrate.
48. The method of claim 39, wherein said substrate is a two piece mold.
49. The method of claim 39, wherein said substrate is formed of a meltable, sublimable, combustible or dissolvable material.
50. The method of claim 39, wherein said substrate is formed of wax.
51. The method of claim 47, wherein perfusion tubes are positioned within said substrate prior to applying said charged layers.
52. The method of claim 47, wherein a guidewire lumen is positioned within said substrate prior to applying said charged layers.
53. The medical device of claim 1, wherein said medical device comprises a balloon that is configured for insertion into and inflation within a body lumen of a subject, said balloon comprising a multilayer region that further comprises: (a) at least five charged nanoparticle layers comprising charged carbon nanotubes; and (b) at least five charged polyelectrolyte layers comprising charged polyelectrolyte species.
54. The medical device of claim 53, wherein said charge polyelectrolyte layers are selected from polyacrylic acid, polyethylene imine, or a combination of both.
55. The medical device of claim 53, further comprising an inflatable balloon underlying said multilayer region.

56. The medical device of claim 53, further comprising a fibrous reinforcement member.